

983,076.

W. McNAUGHT.
 DRYING MACHINE.
 APPLICATION FILED OCT. 11, 1909.

Patented Jan. 31, 1911

3 SHEETS—SHEET 1.

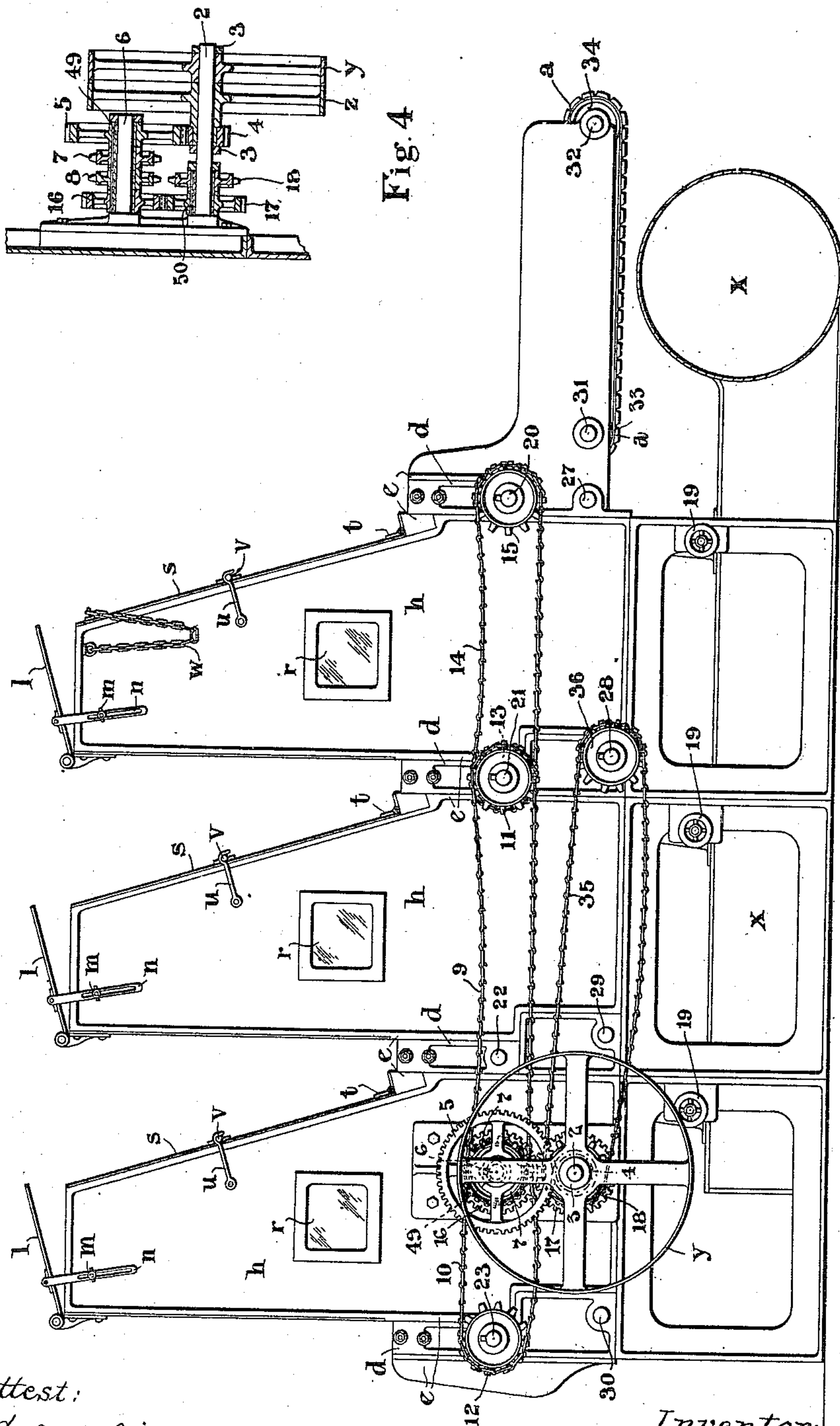


Fig. 4

Fig. 1

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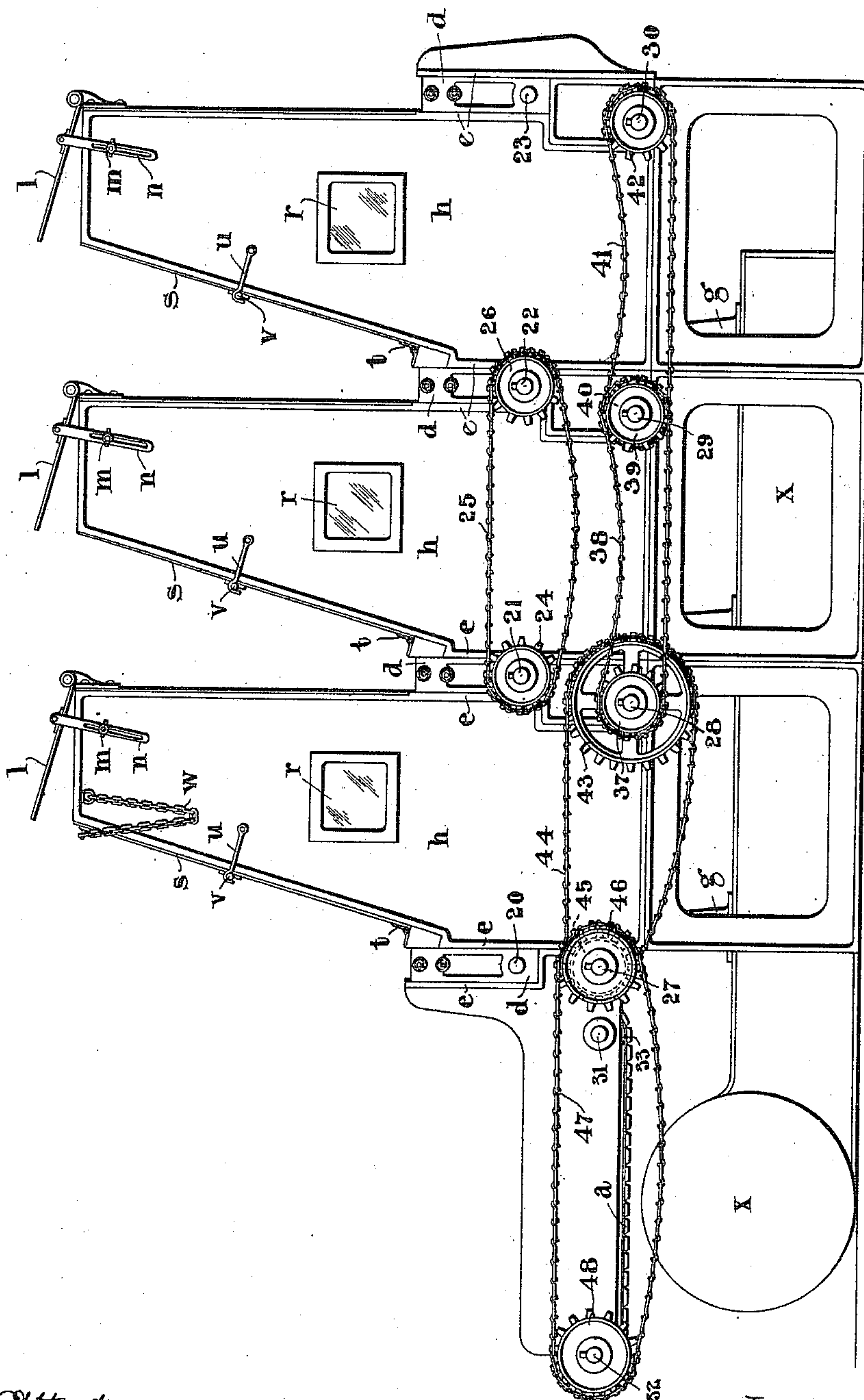


Fig. 2

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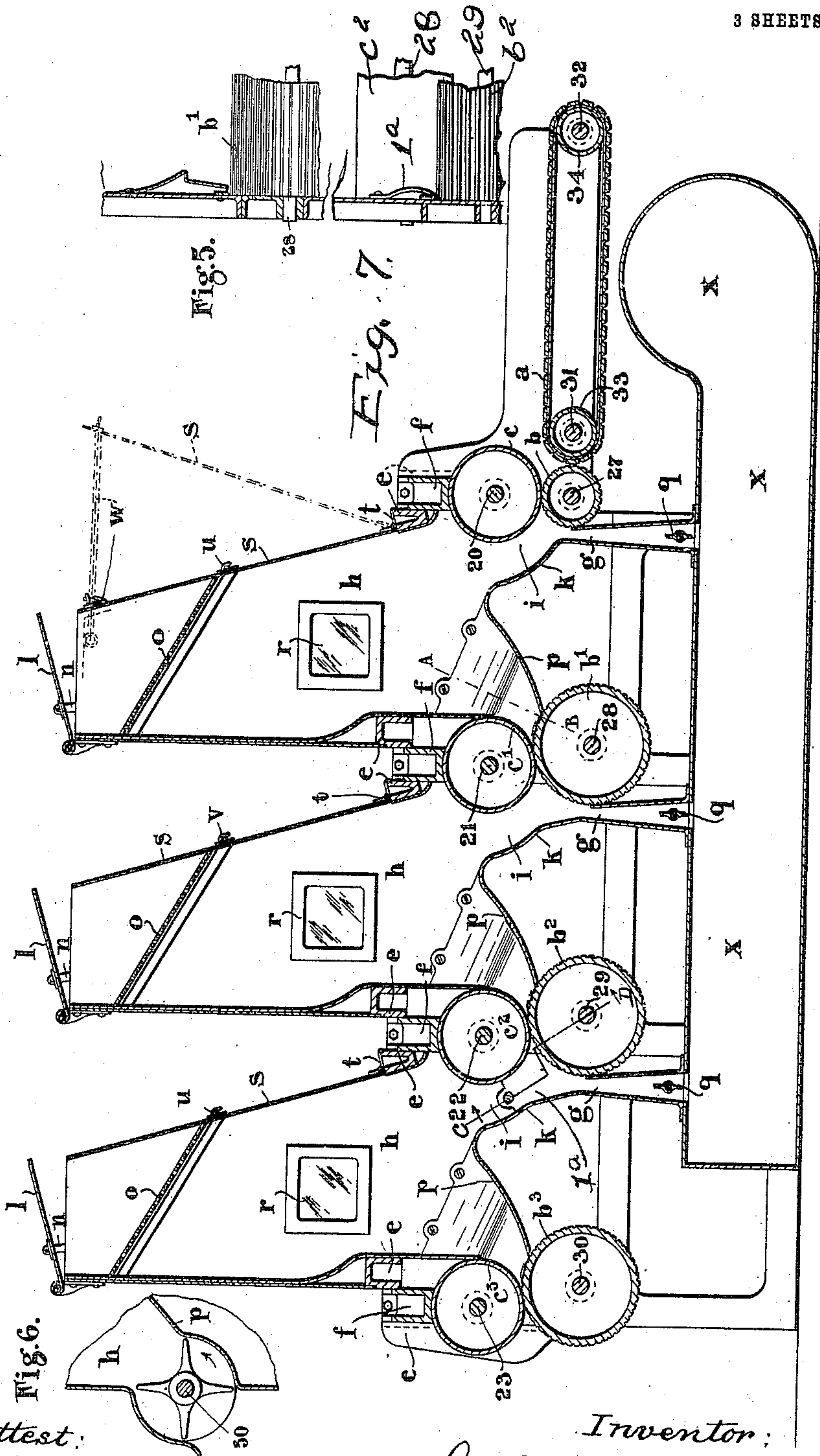
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UNITED STATES PATENT OFFICE.

WILLIAM McNAUGHT, OF ROCHDALE, ENGLAND.

DRYING-MACHINE.

983,076.

Specification of Letters Patent.

Patented Jan. 31, 1911.

Application filed October 11, 1909. Serial No. 522,063.

To all whom it may concern:

Be it known that I, WILLIAM McNAUGHT, a subject of the King of Great Britain and Ireland, and residing at St. George's Foundry, Rochdale, in the county of Lancaster, England, have invented certain new and useful Improvements in Drying-Machines, of which the following is a specification.

This invention relates to machines for drying wool and other fibrous materials, textiles, fabrics and the like and hereinafter referred to as the material.

The object of the present invention is to enable the material treated to be dried in a much more efficient manner than is possible with the usual form of drying machine, and particularly to provide a machine of comparatively small dimensions but of considerably increased capacity as compared with the cumbersome machines hitherto employed in which the material entering the machine through feed rollers is blown by an air blast on to the first of a series of traveling bands or conveyers, which ultimately deliver it at the outlet end after it has been carried in a very prolonged path through the machine in contact with the same air which entered at the beginning, and which practically remains in contact with it during its whole travel, the air becoming saturated at the beginning of said travel and failing to extract the amount of moisture which is essential to the correct drying of the material, with the consequence that combined with the motion given to the material by the traveling bands, the material is apt to be delivered in the form of entangled masses, or what are termed "balls", the interior of which still remains in a wet condition.

According to the present invention the necessity for the traveling bands or conveyers within the machine and their attendant disadvantages, as above referred to, are entirely avoided. The wool, as it enters the machine is held by the feeding rollers momentarily in a blast of air, and then as it is released, is blown by the air into a chamber, which has such a volume, and is provided with a free outlet for the air of such capacity that the velocity of the air within the chamber drops sufficiently to allow the material to fall and to be discharged from the machine, the material during its exposure to the blast and also during its flight, being freely

opened out and thoroughly exposed to the drying effect of the air current. The air which has extracted the moisture from the materials is allowed to escape and while in its moist state is not allowed to come in contact with the material again.

In cases where the material is to be further treated it is fed into a second machine where it is treated by another supply of air. In this respect the invention comprises the combination of a series of machines having the characteristics above set forth, and so arranged that the material treated in the one is passed into others in succession, being subjected to a further blast of air in each case.

The accompanying drawings illustrate by way of example one form of machine according to the invention, Figures 1 and 2 being side elevations, Fig. 3 a side sectional elevation of the complete apparatus and Fig. 4 being a detail section view of some gearing which may be employed. Fig. 5 is a section on the line A—B Fig. 3. Fig. 6 shows a modification of a detail. Fig. 7 is a section on the line C—D, Fig. 3.

In carrying out the invention according to one mode the material to be dried is fed for example by a brattice or endless conveyor, *a*, to a pair of feeding rollers, *b c*, the lower of which, *b*, is preferably grooved or otherwise provided with a frictional surface upon its periphery and is run at a peripheral speed equal to the speed of the brattice, *a*, the latter being conveniently mounted upon rollers, 33, 34, in turn mounted upon the spindles, 31, 32. The roller, *c*, is preferably smooth upon its periphery and is mounted in bearings, *d*, which are free to slide vertically within guides, *e*, formed by part of the framing of the machine, so that the roller, *c*, yields to excessive thicknesses of material passing beneath. The rollers *b* and *c*, may be driven in any convenient manner and one mode of driving them will be hereinafter described.

Above the roller, *c*, is a packing bar, *f*, shaped on its under side to conform to the roller. This bar, *f*, is also free to move vertically with the roller and for this reason may be bolted to the bearings, *d*, being also guided between the guides, *e*, forming part of the framing of the machine. The packing bar, *f*, maintains a practically air-tight joint between the roller and the casing of the machine and so avoids escape of air over the

roller and the consequent escape of material at that position. As the material passes between the rollers, $b\ c$, it first meets an air blast which is introduced through a nozzle, g . The material is thus held for a time in this blast until it is released by the rollers, $b\ c$, whereupon the blast carries it up into a chamber, h , which is of large cross sectional area as compared with the cross sectional area of the nozzle, g , and also of the passage, i , formed by the part, k , of the casing and the roller, c , which passage is preferably of increasing cross sectional area as it approaches the chamber, h . Consequently when the material is released by the rollers, $b\ c$, and is blown into the chamber, h , it falls, owing to the sudden drop in the velocity of the air current in said chamber, the top of which is opened to the atmosphere or to a flue. The top of this chamber, h , may, if desired, be fitted with a hinged door, l , which may be set in various positions by means of a fly nut, m , and a slotted link, n , or by any other suitable device so that the area of the outlet may be regulated as desired. This door, l , may be omitted in some cases; similarly a perforated guard, o , may be fitted at or near the upper end of the chamber, h , to prevent the material being blown entirely out, or to collect any foreign matter which may be blown out of the material.

While the material is held by the rollers, c , and exposed to the blast in the passage, i , it tends to open out, under the force of the blast, to the drying action of the air current and when it is released by the rollers and is blown into the chamber, h , it is still further opened out so that the effect of the air current is accordingly increased. When it falls it is caught by the apron, p , and is delivered from the machine preferably by a second pair of rollers, $b'\ c'$.

In actual practice it may not be necessary to use an air blast of sufficient force to carry the material far up into the chamber, h , the force of the air blast being regulated to suit the nature of the material treated; for instance, the nozzle, g , may be fitted with a valve, q , operable by hand wheels 19, so that the blast may be regulated as desired. The chamber, h , may be provided with inspection windows, r , and also, if desired, with inspection doors s , which may be hinged as at t , and may be locked in the closed position by hooks, u , engaging pins, v . The end door or each door may, if desired, be fitted with a safety chain, w . The air for the nozzle, g , may be supplied in any suitable manner, for instance by an air trunk, x .

When it is desired to give the material more than one treatment, it may be led in succession into a number of machines, such as above described, but it is preferred to

combine a series of such machines together as in the example illustrated, wherein the delivery rollers, $c'\ b'$, of the first machine form the feeding rollers for the next, the delivery roller, $b^2\ c^2$, of the second forming the feeding rollers for the third and so on. Each machine in the example shown is similarly arranged, the corresponding parts in each case being indicated by similar letters or reference numerals.

When the wool or other material passes from one compartment into the next through the delivery rollers, it has a tendency to work its way into and clog the bearings of the rollers. In order to insure that the rollers shall run freely in their bearings, side chutes, 1, shown in Fig. 3 and in section in Fig. 5, are attached to, or formed integral with the sides of the chamber, h . These chutes which are preferably made of sheet zinc though they may be formed of any other suitable material, such as wood, are made to curve inwardly (as shown in Fig. 5) to a point a little above the level of the point at which the material is fed through the rollers. They are then bent outward for a short distance parallel to the surface of the roller and then gradually taper off toward the sides of the chamber. By means of these inwardly curved side chutes, one on each side of the chamber, the wool or other material is thrown toward the center of the rollers, and is passed through the same before it has time to reach the edges of the rollers.

If desired chute plates 1^a, Figs. 3 and 7, may also be placed on each side of the chamber at the delivery side of the rollers. These plates lie slightly closer to the sides of the chamber than the ones shown in the drawings so that the wool, in spreading through the rollers, may not come in contact with their edges. The object of these additional chute plates is, of course, to prevent the wool from getting off the ends of the rollers on the delivery side.

It will be noticed that whereas all the nozzles g , are connected with the same air trunk, x , the air discharged by each nozzle acts separately upon the material and in passing into its respective chamber h , does not again, while in its moist condition, meet the material, but escapes freely to the atmosphere. The material is thus successively treated with a further supply of dry warm air so that it is very effectively dried and when it issues from the final pair of rollers $b^3\ c^3$, it is in an excellent condition.

It will be understood that any number of machines may be combined together in the manner above described, the number depending upon the nature or condition of the material to be treated or the final condition in which it is required.

In the arrangement illustrated the series

of rollers, b , c , b' , c' , b^2 , c^2 , b^3 , c^3 are driven as follows:—A pair of belt pulleys y z , are loosely mounted upon a stationary arbor, 2, being retained thereon by collars, 3. The pulley, z , is provided with a pinion, 4, meshing with a wheel, 5, keyed upon a bush, 49, on a stationary arbor, 6, (Fig. 4). Two sprocket pinions, 7 and 8, are also keyed upon the bush, 49, and by means of chains, 9 and 10, drive sprocket pinions, 11 and 12, mounted upon the spindles, 21 and 23, of the rollers, c' and c^3 . A sprocket pinion, 13, also mounted upon the spindle, 21, drives by means of a chain, 14, a sprocket pinion, 15, mounted upon the spindle, 20, of the roller, c . Upon the opposite end of the spindle, 21, to that upon which pinions, 11 and 13, are mounted, is a sprocket pinion, 24, (Fig. 2) which by means of a chain, 25, drives a sprocket pinion, 26, upon spindle, 22, of the roller, c^2 .

In the arrangement above described all the rollers c , c' , c^2 , c^3 , are of the same size and in order to insure that they shall run at the same velocity all the sprocket pinions corresponding to them are of the same diameter, but it is to be understood that the rollers, c^2 , c^3 need not be of the same diameter, in some cases, and the ratio of the gearing for driving them may be varied to suit any special requirements.

Keyed upon the bush, 49, on the stationary arbor, 6 (Fig. 4) is a toothed wheel, 16, which meshes with a toothed wheel, 17, keyed upon a bush, 50, rotatable on the stationary arbor, 2. A sprocket pinion, 18, is also keyed upon the shaft, 2, and by means of a chain, 35, drives a sprocket pinion, 36, mounted upon one end of the spindle, 28, of the roller, b' . Upon the other end of the spindle, 28, is a sprocket pinion, 37, which drives by means of a chain, 38, a sprocket pinion, 39, mounted upon the spindle, 29, of the roller, b^2 . Another sprocket pinion, 40, on the spindle, 29, drives, by means of a chain, 41, a sprocket pinion, 42, mounted upon the spindle, 30, of the roller, b^3 . As the rollers, b' , b^2 and b^3 , in the example illustrated are of the same diameter and it is desired that they shall rotate at the same speed their corresponding sprocket pinions are also of the same diameter. The first roller, b , however is of smaller diameter and in order that this shall rotate at the same velocity as the other rollers and also at the same velocity as the brattice, a , a large sprocket wheel, 43, is mounted upon the spindle, 28, and by means of a chain 44, drives a sprocket pinion, 45, upon the spindle, 27, of the roller, b , the ratio of the wheel, 43, to the pinion, 45, being that necessary to give the required increased revolutions to the roller, b , to compensate for its smaller diameter. A sprocket pinion, 46, upon the spindle, 27, drives by means of a

chain, 47, a sprocket pinion, 48, mounted upon the spindle, 32, of the roller, 34, of the brattice, a , the diameters of the pinions, 46 and 48, being equal, and the diameters of the rollers, 33 and 34, of the brattice, a , being such as to insure that the velocity of the brattice shall be equal to the peripheral speed of the roller, b .

The invention is not confined to any particular shape of casing, form of feeding or delivery rolls or of the gearing for driving the same as all these details may be varied or modified to suit the character of the material to be treated and the quantity that is to be operated upon in connection with any particular plant that is to be constructed. Similarly the invention is not confined to the use of rollers for discharging the material from the machine as any suitable mechanism as in the form of a paddle as shown for example, in section in Fig. 6, or other gate like apparatus may be used.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:—

1. A drying machine for wool and other material comprising an air blast nozzle, means for feeding material and subjecting it in an unconfined condition to the action of air blast issuing from said nozzle, and means for immediately afterward continuously and separately conveying away the air and the material.

2. A drying machine for wool and other material comprising an air blast nozzle, means for feeding material and subjecting it in an unconfined condition to the air blast issuing from said nozzle, and means for immediately afterward separating and continuously and separately conveying away the air and the material.

3. A drying machine for wool and other material comprising a series of air blast nozzles, means for feeding the material to and momentarily freely suspending it in the air blasts in succession and means for continuously and separately conveying away the air and the material immediately after each successive operation.

4. A drying machine for wool and other material, comprising an air blast nozzle, means for feeding the material to the air blast issuing from said nozzle, a chamber of large volume in comparison with said nozzle and adapted to receive and separate the air and the material, said chamber having an outlet for air, and a separate outlet for the material, and means for continuously delivering the dried material therethrough.

5. A drying machine for wool and other material comprising a chamber, a pair of feeding rollers, a chute plate on each side of said chamber adjacent to the feeding rollers, an air blast nozzle adjacent to said rollers and means for continuously and separately

delivering the air and the material from said chamber.

6. A drying machine for wool and other material comprising a chamber having an upper air outlet, a pair of feeding rollers, an air blast nozzle adjacent to said rollers adapted to momentarily act on the material, fed in by said rollers, and immediately afterward to blow said material direct into the aforesaid chamber, and means for continuously and separately delivering the air and the material from said chamber.

7. A drying machine for wool and other material comprising a chamber having an air outlet, a perforated screen across said outlet, a pair of feeding rollers near the bottom of said chamber, a blast nozzle adjacent to said rollers adapted to momentarily act on the material, fed in by said rollers, and immediately afterward to blow said material direct into the aforesaid chamber and means for continuously and separately delivering the air and the material from said chamber.

8. A drying machine for wool and other material comprising a chamber having an upper air outlet, and a diverging passage near the bottom, an air blast nozzle adapted to discharge air into said passage, means for feeding material into said passage and means for continuously and separately delivering the air and the material from the aforesaid chamber.

9. A drying machine for wool and other material comprising a chamber having an upper air outlet, an air blast nozzle communicating with said chamber at the bottom, a pair of rollers for feeding in material adjacent to said nozzle and a pair of rollers for delivering the material from the chamber, substantially as and for the purpose hereinbefore set forth.

10. A drying machine for wool and other material comprising a chamber having an upper air outlet, an air blast nozzle communicating with said chamber at one side, a pair of rollers adjacent to said nozzle for feeding in material and a pair of rollers on the opposite side for delivering material from said chamber, the relation of the cross sectional area of the nozzle being small compared with that of the chamber, substantially as and for the purpose hereinbefore set forth.

11. A drying machine for wool and other material, comprising a series of chambers each having an air outlet, an air blast nozzle, means adjacent to said nozzle for feeding in material, and means for delivering the material after treatment into the next succeeding chamber.

12. A drying machine for wool and other material, comprising a series of chambers each having an air outlet at the top, an air blast nozzle communicating with it at the bottom, means for feeding in material adjacent to said nozzle and means for delivering the material after treatment to the next succeeding chamber, the delivery means for each of the chambers except the last forming the feeding means for the next succeeding chamber.

13. A drying machine for wool and other material comprising a series of chambers each having an air outlet at the top, an air blast nozzle communicating with it at the bottom, a pair of feeding rollers adjacent to the nozzle and a pair of delivery rollers on the side remote from said feeding rollers, the delivery rollers of each chamber forming the feeding rollers for the next succeeding chamber.

14. A drying machine for wool and other material comprising a series of chambers each having an air outlet, an air blast nozzle communicating with each chamber, a common air trunk for said nozzles, means for separately regulating each nozzle, means for feeding in material into each chamber adjacent to the respective nozzle, and means for delivering material from each chamber into next succeeding chamber.

15. A drying machine for wool and other material comprising a series of chambers each having an air outlet at the top and a diverging passage near the bottom, an air blast adapted to discharge air into each chamber through said passage, rollers for feeding material therein, and means for delivering the material from each chamber to the feeding rollers of the next succeeding chamber, substantially as and for the purpose hereinbefore set forth.

16. A drying machine for wool and other material comprising a series of chambers each having an air outlet at the top and a diverging passage near the bottom, an air blast adapted to discharge air into said chamber through said passage, a pair of rollers for feeding material into the passage of each chamber said rollers also acting as the delivery rollers for the preceding chamber in each case, and means for rotating said rollers, substantially as and for the purpose hereinbefore described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM McNAUGHT.

Witnesses:

J. J. MOFFET,

JAMES W. PRESTON.